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360.* GLYCERIA PROCUMBENS, Sm.—June. 8th Ave.
361. Poa trivialis, L.—May. 107th St.
†362.* Festuca Myurus, L.—May. 107th St.
†363.* *Hordeum murinum*, L.—July. Com. 8th Ave.
364.* *Paspalum distichum*, L.—June–Aug. Com. So.
365.* Equisetum variegatum, Schlecht.—June. Com.

New York, Dec. 3, 1880. ADDISON BROWN.

§ 100. **The Value of Herbaria.**—The following extracts from *La Phytographie par Alph. De Candolle, Paris*, 1880, merit the consideration of those who may have it in their power to promote the growth of our public collections of dried plants:

The purposes of Herbaria are to acquaint us with the exact names of plants, to furnish the materials necessary for their description, and to preserve the evidences or explanations in regard to descriptions already published.

Collections of this nature are superior to those we can have in Zoology. Dried plants are in a condition of completeness or nearly so, whereas shells, skeletons or stuffed animals exhibit merely certain portions of the organism. They have usually several flowers or fruit, and these admit of additional dissection for their verification. Specimens are so little altered in drying, that it is easy by means of a simple immersion to view the most minute and delicate organs. In certain cases we see them even better than in the living plant; as for instance when we examine ovules involved in a pulpy substance, or membranes that become very nicely separated by desiccation.

If we compare collections of dried plants with those of living ones, the respective advantages are more evenly balanced than is generally supposed. In a Herbarium we see simultaneously specimens of neighboring species, and of those from different localities; also specimens of different ages, or of different states of the same species. We know the name of the plant if the collection has been well determined, and are referred directly to the authors who have spoken of it. We are sure of its place of origin, as it is indicated on the label. The living plant, on the other hand, affords more opportunities for certain anatomical observations; it admits of a better description of some characters of little importance, such as color, odor, etc. But plants in the field and forest are not named, and in Botanical Gardens they are often very badly named. The geographical origin of their plants is almost always uncertain or unknown. Individuals are often modified by cultivation and by hybridation; seldom can we see fruit along with the flower; seldom numerous individuals of the same species; and more seldom still is a botanist permitted to gather sufficient specimens of an exotic plant, so that he can examine it as he would, and can preserve the evidences to substantiate his work.

When we reflect upon these differences, we are surprised to see so much lukewarmness shown by anatomists and physiologists to all that concerns Herbaria. Without their aid these gentlemen could not be sure of the name of any plants except the most common ones. They go at hap-hazard from one species to another, from one genus to another, without being advised of their affinities by classification and the view of numerous specimens, such as are to be found in a Herbarium. They can themselves testify, how much more considerable an amount of work has been done in the Herbarium than in the Gardens, and that, too, in regard to microscopic organs, such as pollen, ovules, embryos, archegonia or spores. Without Herbaria we should not have had, at this moment, either good general treatises or good floras ; and published descriptions would have been without material evidences, just as are those in the works of Rumphius and Plumier, skilful naturalists though they were. It would have been just as it is with a good many of the observations made with the microscope : the elements for such observations, obtained by some happy section, have ceased to exist.

The indifference of public administrative bodies in regard to Herbaria is as extraordinary as is that of anatomists and physiologists, when we consider how small is the cost of collections of this nature, as compared with that of Gardens. This comparison has never been been made, and it is worth while to say a few words on the subject.

Leaving out of view the cost of ground and buildings, which is however insignificant for a Herbarium, but considerable for a Botanical Garden, let us look merely at the relative expense of keeping up the two kinds of collections. An extensive private Herbarium costs on an average only 3,000 or 4,000 francs a year for purchase of plants, paper and other materials, and for the salary of a custodian employed during a portion of the day. A public Herbarium of corresponding importance, more completely accessible to botanists, and consequently having more *employés*, and directed by a professor, a portion of whose salary should be charged, costs or ought to cost say 10,000 francs per annum. The great majority of public Herbaria do not cost so much ; and this may be perceived from their pitiable condition. There are perhaps not ten public Herbaria in the world with resources sufficient for a proper increase, and for a good arrangement of what they have. Perhaps all the public Herbaria of the five parts of the world do not cost altogether in their present condition more than 200,000 francs a year. And yet it is with this that nine-tenths of all the good work in descriptive botany has been done, and horticulturists, anatomists and physiologists have been furnished with the means of knowing the exact names of plants, and of making those researches, for which *exsiccatae* are particularly suited.

A Botanical Garden of moderate size costs not less than 4–5,000 francs a year. Many others take 10–15,000 francs, and the extensive Gardens, which may be compared with the grand Herbaria, expend as much as 60–80 or 100,000 francs annually. Take a list of the one hundred most important Botanical Gardens, beginning with those of Kew, Paris, Buitenzorg, Calcutta, St. Petersburg, &c., then those attached to universities, and finally others in places without universities, the average annual expense would be at least 15,000 francs for each establishment, or one and a half million francs for the hundred Gardens. The total number of these Gardens being greater than one hundred, it is probable that there is expended for the keeping of living plants, a part of which die each year, nearly two million francs per annum. Deduct what is proper to be charged to the amusement of the public and the instruction of students, there still remains an expenditure five times greater than that for Herbaria, and all for a vastly inferior scientific result.*

If governments could only agree to devote to the *Hortus siccus* a portion of the sum they apply to Botanical Gardens, a singular impulse would be given to Botany. By promising, for instance, to purchase collections of *exsiccatae* from countries not yet explored, they would advance the knowledge of all the plants of our epoch, in the double point of their nature and of their geographical distribution. A few thousand francs appropriated to Herbaria, on the part of which there might be an engagement to perform a certain amount of work in the way of arrangement and of determination, would cause many an existing collection to emerge from its present chaotic condition. Anatomists, physiologists, horticulturists and directors of Botanic Gardens could at least determine plants with certainty and without too great trouble; but, above all, authors of floras and of monographs would be able to work with good materials, and would give us fewer of those deplorable descriptions that I have characterized as enigmatical.

§ 101. **Double Flowers.**—M. Heckel, in a note to the Academy (*Comptes Rendus* Oct. 4th, p. 581) attributes the formation of double flowers, through petaloid development of the stamens, to long-continued self-fertilization. His observations have been made on *Convolvulus arvensis*, L., the flowers of which vary from deep rose-color, through white with purplish markings, to immaculate white. He regards the last named (pure white) as an example of the Darwinian idea that flowers lose their color through close fertilization. The two white varieties observed by M. Heckel were found to have a frequent tendency to be affected with petalody of the stamens. Believing this to be due to the same cause, close-fertilization, he undertook a series of experiments on the plant, extending over a period of three years. The results reached are in perfect accordance with the opinion that he had formed, the third generation of the plants giving him an abundance of double flowers. While M. Heckel's observations are important, it cannot be that double flowers are wholly due to the causes he adduces, since we have numerous examples of such among insect-fertilized flowers, of which the rose furnishes a conspicuous example.

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*The author elsewhere compares the value of plates, engravings, &c., with that of dried specimens, and gives the following statistics of their relative cost:

The number of botanical plates in existence exceeds 120,000, and they have cost at least twenty-four million francs. This is the valuation of the *stock* deposited in libraries! Have the results been commensurate with this vast expenditure? I will leave it to each one to answer this question according to his own ideas. But as a term for the comparison, I will add, that a very rich Herbarium, of one hundred thousand species and one million specimens, does not represent more than 3 or 400,000 francs of successive expenditures. Seven or eight hundred Herbaria, equal in size to the best twenty in existence, would represent the same cost as the plates.